

BAT HIBERNACULA SURVEY AND WNS MONITORING 2015



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EXECUTIVE SUMMARY

White nose syndrome (WNS) is now well established in the cave and karst counties of Tennessee. A total of 29 counties were surveyed, of those 6 were not previously known to have WNS. The number of confirmed counties rose only slightly from 46 in 2014 to 50 in 2015. This means that of the 78 cave and karst counties in Tennessee 64% have been confirmed positive. Sumner County still remains suspect. Davidson County is field sign positive as no samples were submitted. A total of 58 caves were surveyed in the 28 counties. One civil war munitions bunker was surveyed in Tipton County.

The 2015 hibernacula survey period also included surveys of Tennessee's three priority 1 gray bat hibernacula and was part of the national effort to monitor gray bats at the same time. Gray bat numbers were up from 2014. Numbers for the gray bat sites have always been difficult to obtain due to conditions in the caves and complexity of the caves. The estimated wintering gray bat numbers for the 3 priority caves at 1,095,975.

White Oak Blowhole, Tennessee's only Indiana bat priority 1 caves, is located in the Great Smoky Mountains National Park in Blount. At this cave Indiana bat numbers declined from 9,076 in 2013 to 1,753 in 2014, to a current low of 1,117. The estimated wintering Indiana bat numbers for Tennessee are now 3,676. Little brown, tri-colored, and northern long-eared bat hibernacula counts have shown a steep decline.

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INTRODUCTION

Very limited information is available on bat hibernacula and population trends in Tennessee. Only Indiana bat (*Myotis sodalis*) and gray bat (*Myotis grisescens*) hibernacula have been surveyed with any regular frequency. Little brown bat (*Myotis lucifugus*), northern long-eared (*Myotis septentrionalis*), eastern small footed (*Myotis leibii*), big brown (*Eptesicus fuscus*), tri-colored (*Perimyotis subflavus*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) numbers are sporadic at best. After the discovery of white nose syndrome (WNS) caused by *Pseudogymnoascus destructans* (*P. destructans*) (formerly *Geomyces destructans*) in New York, TWRA and partnering Agencies began an extraordinary task to survey caves in Tennessee for hibernating bats. With close to 10,000 caves in the state that task has been difficult. Although there are a large number of caves in the state only a small percentage are likely to contain any significant numbers of hibernating bats. Since 2010 TWRA and partnering agencies (see acknowledgements page for list) have worked to survey new caves with potential hibernating bats, monitor known bat hibernacula populations, and monitor the spread of WNS.

The 2015 survey period targeted at priority hibernacula of the gray bats and Indiana bats. The three priority gray bat caves, 24 Indiana bat caves, a sample of WNS confirmed caves, and new caves were surveyed. The hibernacula surveys and WNS surveillance have helped identify new bat hibernacula and to track hibernacula changes. Each year more is learned about the effects of WNS and continued surveillance will allow TWRA to better understand effects of WNS on Tennessee's bats as well determine future bat population indices trends.

METHODS

Caves were surveyed between December 15th and April 1st. Typically teams of 2 to 4 biologists conducted surveys of caves that were either known to have bats or based on available information may have contained enough bats to justify surveying. All surveyors follow the recommended WNS decontamination protocols recommended by U.S. Fish and Wildlife Service.

WNS surveillance followed a tiered approach designed to detect possible WNS infection and to minimize disturbance during surveys.

- Tier 1 surveys:** a full hibernaculum count, examination of all accessible bats for signs of WNS, and band placement and/or recovery (where appropriate).

- Tier 2 surveys:** a quick population estimate, examination of all accessible bats for signs of WNS, and band recovery (where appropriate).

- Tier 3 surveys:** observations made outside of cave entrances to check for unusual winter bat behavior (e.g. daytime activity in the cave entrance).

WNS Status Terms:

Field Signs: A site listed as showing field signs means that at least one bat was observed at the site with what appeared to be a white fungus. The observation may or may not be *Pseudogymnoascus destructans* (P.d.) (formerly *Geomyces destructans*), but could be another fungus or yeast. When a site is listed as having field signs, an observation is made, but samples were not available to be sent off for testing. Field sign positive is also used when a county is already positive and submitting additional samples is not warranted.

Suspect: In order for a site to be listed as suspect a swab from a bat or other surface is submitted to a lab. Analysis of the swab detects the genetic material of *P. destructans*.

Confirmed: In order for a site to be confirmed WNS positive a carcass or tissue sample of a bat must be submitted to a wildlife disease lab for testing. Histopathology identifies hyphae of *P. destructans* have penetrated cells of the bat resulting in lesions. PCR is used to identify the fungus.

RESULTS

White-nose syndrome (WNS) and *P. destructans* are now well established in the karst region of Tennessee. With 58.9% (Flock 2014) of the karst counties of Tennessee already being confirmed positive for WNS, the effort to confirm the remaining counties as positive has been reduced. Only 29 counties were surveyed in 2015 (figure 1). Of counties surveyed only 6 had not been confirmed positive in previous years. Only four new counties were confirmed positive in 2015 (figure 2). Davidson County was field sign positive; however no samples were submitted for testing. Efforts in 2015 were placed on endangered species hibernacula counts.



Figure 1. Tennessee counties with caves surveyed (green) during winter of 2014-2015.

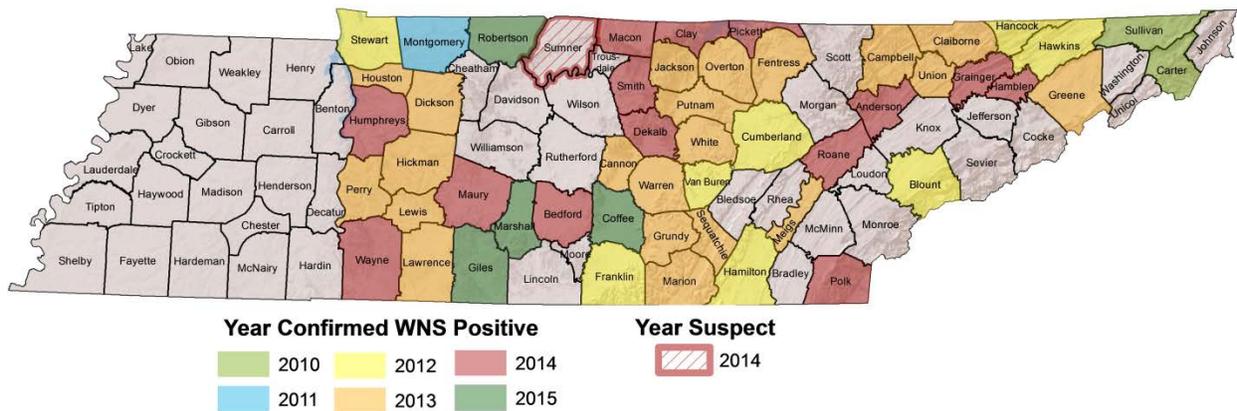


Figure 2. White-nose syndrome spread across Tennessee from 2010-2015 based on samples submitted for testing.

Hibernacula Trends

This year was the priority hibernacula cave survey year for gray bats and Indiana bats. Gray bat numbers increased from 2014 and continue to show a positive trend (Figure 3). With drop in number of bats from Whiteoak Blowhole in 2014 the number of Indiana bats decreased significantly in the state (Figure 4). If we look at only Priority 2 through 4 Indiana bat hibernacula the trend is down, but numbers are slightly above 2003 (Figure 5). Little brown bats showed a continued decline from 2011; however Rafinesques’s big eared bats showed little to no change from 2011 (Figure 6). Northern long-eared bats showed a significant drop in hibernacula numbers while big browns showed a positive trend since 2011 (Figure 7).

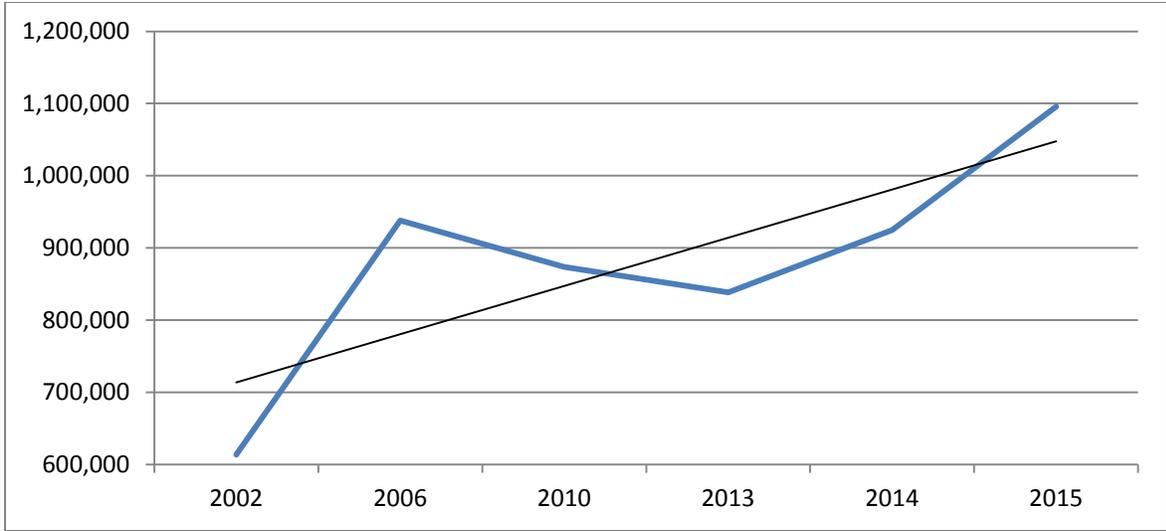


Figure 3. Gray bat hibernacula estimates 2001 through 2015 with trend line.

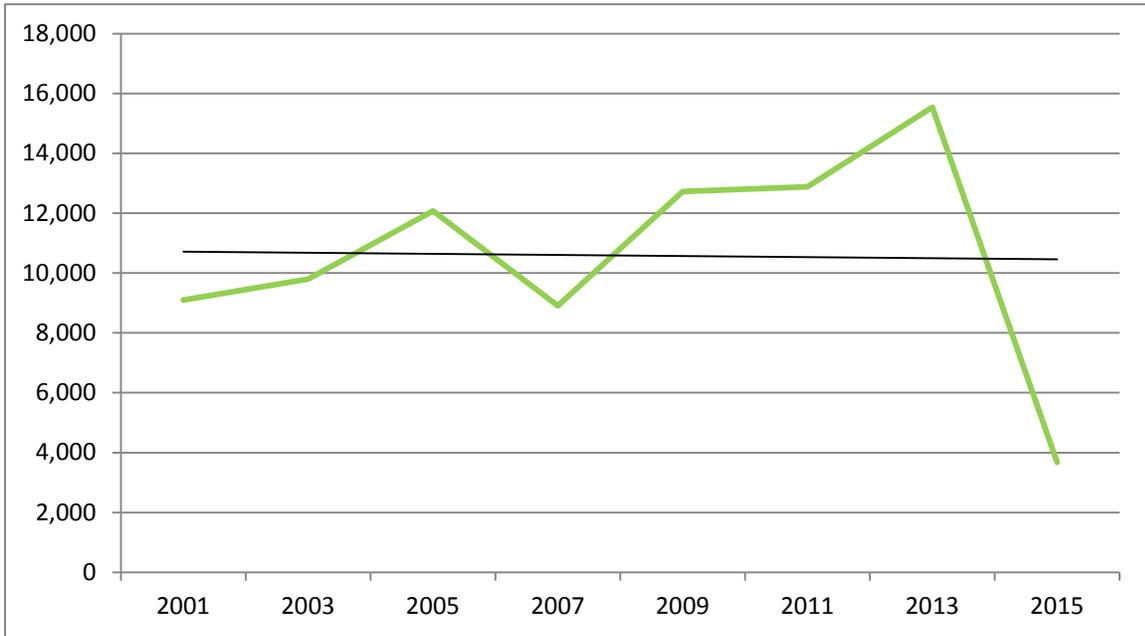


Figure 4. Indiana bat hibernacula estimates 2001 through 2015 with trend line

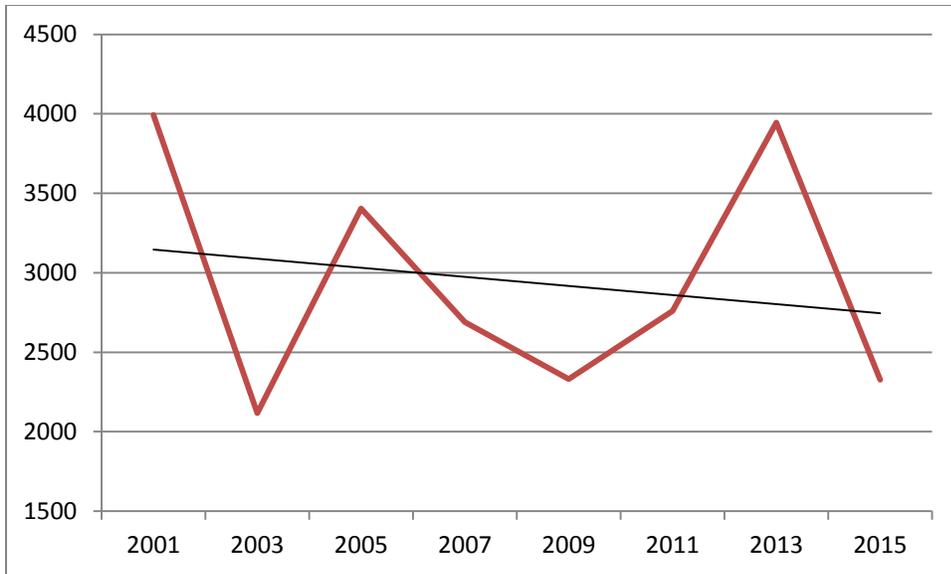


Figure 5. Indiana bat hibernacula estimates excluding the only priority 1 hibernacula (Whiteoak Blowhole) from 2001 to 2015 with trend line.

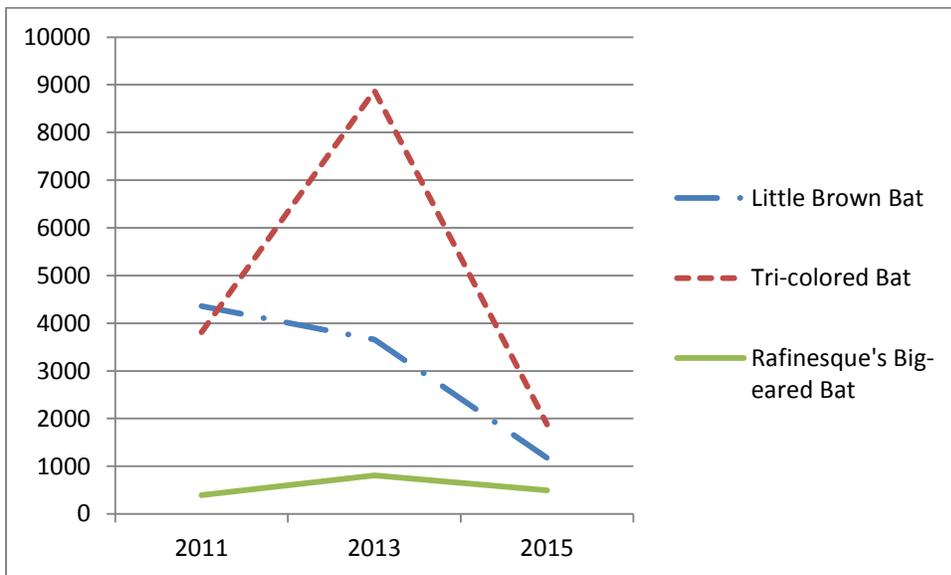


Figure 6. Hibernacula estimates for caves surveyed in 2011 through 2015 for little brown, tri-colored, and Rafinesque's big-eared bat

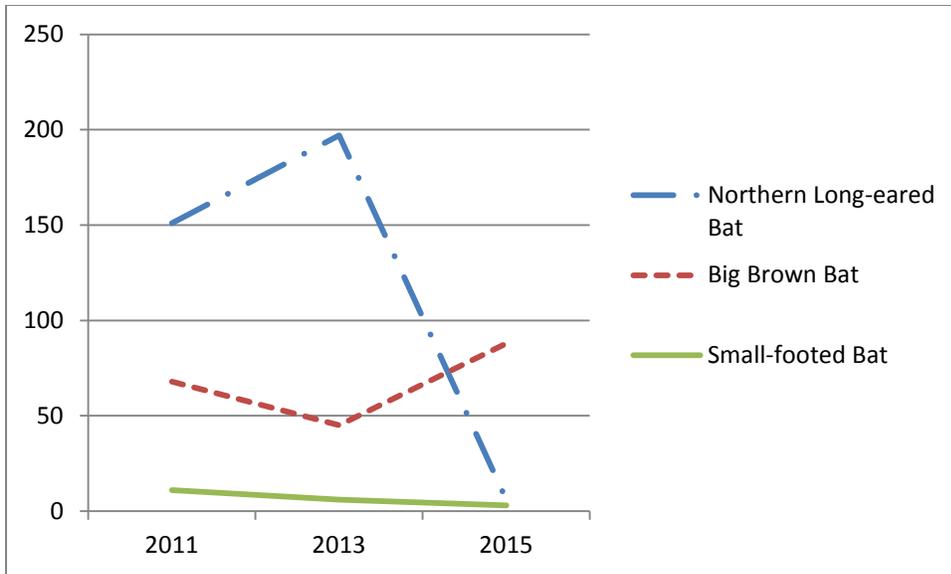


Figure 7. Hibernacula estimates for caves surveyed in 2011 through 2015 for northern long-eared, big brown, and small-footed bats.

White-nose Syndrome Cave Status

Table 1. Caves that had samples submitted for testing (suspect, confirmed) and field observations of White-nose Syndrome for 2015.

County	Cave Name	Status
Marshall	Petty Cave	Confirmed
Coffee	Crumpton Creek Saltpeter Cave	Confirmed
Moore	Silvertooth Cave	Confirmed
Giles	Magnusson Cave	Confirmed
Robertson	Stark Cave	Confirmed
Davidson	Hardins Junkyard Cave	Field Signs

CONCLUSION

During the 2015 hibernacula season the effects of WNS on different species began to be realized. Gray bats, Rafinesque’s big-eared bats, and big brown bats showed very little impact from WNS. However, little browns, tri-colored bats, and northern long-eared bats saw declines from previous years. These

impacts were not unexpected, however it was hoped due to the southern latitude of Tennessee that WNS impacts would be lessened. Winters in Tennessee over the last 2 years have been colder than previous 2 years this may have resulted in fewer insects for bats to feed on during the winter and resulted in bats either not returning after winter feeding excursions or bats having lower fat reserves leading to increased overall mortality.



Figure 8. Gray bats cluster Hubbards Cave.

APPENDIX

Survey data from 2015 hibernacula surveys conducted from December 2014 to April 2015. Bat species observed during survey include Rafinesque's big-eared bat (CORA), big brown (EPFU), gray bats (MYGR), eastern small footed (MYLE), little brown bat (MYLU), Indiana bat (MYSO), northern long-eared (MYSE), tri-colored (PESU), and unidentified Myotis sp. (MYsp).

Co u n t y	Cave Name	Survey Date	M YSO	M YLU	M YGR	M YSE	M YLE	M YAU	CORA	PESU	EPFU	M Ys p	L ANO	Total	Surveyors
Blount	Gregorys Cave	2/11/2015								33				33	NPS
Blount	Kelly Ridge Cave	2/20/2015	188	16					67	17	1			289	NPS
Blount	Scott Gap Cave	2/19/2015		3					3	18				24	NPS
Blount	Whiteoak Blowhole Cave	2/12/2015	1117	20						18				1155	NPS
Blount	WhiteOak Saltpeter Cave	2/19/2015								6				6	NPS
Campbell	New Mammoth Cave	1/21/2015	76	64	1		3			13	4			161	TWRA, TNC
Campbell	Norris Dam Cave	1/21/2015		1						176	4			181	TVA
Coffee	Crompton Creek Saltpeter Cave	3/20/2015			7					5	2			14	TNC, TWRA
Cumberland	Grassy Cove Saltpeter	3/2/2015		42						7	3	2		54	TWRA, UT
Cumberland	Lost Waterfall	1/9/2015												0	TWRA
Cumberland	Oscar Pit	1/9/2015								2				2	TWRA
Cumberland	Run to the Mill Cave	1/30/2015	18			1				18	1			38	TWRA, TNC
Cumberland	Spouting Dome	1/9/2015		2						2	2			6	TWRA, TNC
Davidson	Hardins Junkyard Cave	1/29/2015		7						36				43	TNC
DeKalb	Cripps Mill Cave	2/5/2015	8	21						263	6			298	TNC
Fentress	Cornstarch Cave	1/23/2015	13	123		1				20				157	TWRA, TNC
Fentress	Dragons Breath Cave	2/11/2015	40	103						123				266	TNC
Fentress	Easter Fork Saltpeter Cave	1/14/2015	210	32					1	49	6			298	TWRA, TNC

Co u n t y	Cave Name	Survey Date	M YSO	M YLU	M YGR	M YSE	M YL E	MYAU	CORA	PESU	EPFU	M Ys p	L ANO	Total	Surveyors
Fentress	Little Jack Creek Cave	1/23/2015	8						29	3	3		1	44	TWRA, TNC
Fentress	Mountain Eye System	3/14/2015	92	3	18					13				128	TWRA, TNC
Fentress	Redbud Cave	1/23/2015				1				6				7	TWRA, TNC
Fentress	Smoking Slope	3/14/2015												0	TWRA
Fentress	Wolf River Cave	1/20/2015	1351	796	7	3				84	1			2242	TWRA, USFWS, TNC
Fentress	Ygdrasils Cave	2/9/2015	39							7	1			47	TWRA. UT
Fentress	Zarathustras Cave	2/9/2015	18	6					1	25				50	TWRA. UT
Franklin	Signature Cave (Above)	3/31/2015												0	TWRA
Franklin	Siganture Cave	3/31/2015	1						1	14				16	TWRA, TNC
Giles	Magnusson Cave	3/24/2015								29				29	TNC
Grundy	Trussell Cave	3/12/2015	16		2					25				43	TNC
Hawkins	Pearsons Cave	1/22/2015			431,020						5			431025	TWRA, TNC
Jackson	North Spivey Cave	3/6/2015								31	6			37	TNC
Lewis	Depriest Branch Cave	2/4/2015								34	8			42	TWRA, TNC
Marion	Whiteside Cave	3/11/2015								138				138	TNC, TVA
Marshall	Petty Cave	3/17/2015								118				118	TNC
Meigs	Blythe Ferry Cave	1/28/2015								10				10	TVA
Meigs	Eves Cave	1/28/2015								22	2			24	TVA
Meigs	Sensabaugh Cave	3/12/2015								2	7			9	TVA
Montgomery	Bellamy Cave	1/28/2015		1	381,475					11	11			381498	TWRA, TNC
Montgomery	Cooper Creek Cave	1/28/2015								6	6			12	TWRA, TDEC, TNC
Moore	Silvertooth Cave	3/16/2015								56	4			60	TWRA, TNC
Overton	Xana 2 Cave	1/16/2015		3		1			257	1	2			265	TNC

Co u n t y	Cave Name	Survey Date	M YSO	M YLU	M YGR	M YSE	M YLE	M YAU	CORA	PESU	EPFU	M Ys p	L ANO	Total	Surveyors
Perry	Jaybird Cave	2/3/2015	8	12						134	2			156	TNC
Perry	Alexander Cave	2/3/2015	4	3	3					174	1			185	TNC
Pickett	Big Jordan Cave	1/20/2015	29	6					2	13	3			53	TWRA, TNC, USFWS
Roane	Marble Bluff Cave	1/27/2015								356				356	TVA
Robertson	Stark Cave	3/18/2015			4					137				141	TNC
Stewart	Tobaccoport Saltpeter Cave	2/2/2015	160	35	35					13	15			258	TWRA, TNC
Sumner	Mason Cave	3/8/2015		1		1				204	6			212	TNC
Tipton	Bluff-side Powder Magazine	3/4/2015							1	4	7			12	TWRA
Van Buren	Camps Gulf Cave	2/25/2015	10							10	5	1	1	27	TWRA, UT
Van Buren	Case Brothers Cave E1	2/25/2015								3				3	TWRA, UT
Van Buren	Case Brothers Cave E2	2/25/2015							2		1			3	TWRA, UT
Van Buren	Rice Cave	1/29/2015		1						76				77	TWRA, USFWS
Warren	Hubbards Cave	1/15/2015	78		283,480					4				283562	TWRA, TNC
Wayne	Biffle Cave	2/4/2015	12	12		1				333	2			360	TNC
White	Great Expectations Cave	2/12/2015	46	7				1	265	68	3			407	TWRA, TNC
White	Lost Creek Cave	2/12/2015	29						1	53	6			89	TWRA, TNC
White	Rose Cave	1/26/2015	105	3	1448					81	2			1639	TWRA, UT